Mathematics Policy

CHURCHWOOD PRIMARY ACADEMY

At Churchwood Everyone Can

Intent

At Churchwood Primary Academy we have high expectations for all our children and believe that all our children can achieve highly to become confident and skilled mathematicians. We believe that everyone can achieve in mathematics. For this reason, we adopt particular strategies to help everyone achieve. All staff adopt a growth mindset and challenge the view that some learners cannot success in mathematics. We strive for all our pupils to be curious about mathematics and to understand the importance of mathematics in their everyday lives.

The National Curriculum programmes of study (2014) provide the framework for Mathematics throughout the school and incorporates the Early Learning Goals. In order to support and enhance this, we have adopted a Mastery Approach to Maths.

Mastery is the ultimate aim of all learning in mathematics. A mathematical concept has been mastered when, through exploration, clarification, practice and application over time, a person can represent it in multiple ways, has the mathematical language to be able to communicate related ideas, and can think mathematically with the concept so that they can independently apply it to a totally new problem in an unfamiliar situation.

In line with the National Curriculum for mathematics, at Churchwood, we aim to ensure all children gain:

- Equal access to the whole mathematics curriculum
- Mathematical language which will help them to communicate ideas and information to others through appropriate forms
- Fluency with number and the ability to apply this to a range of contexts
- An ability to build on prior knowledge
- Deep and sustainable learning in mathematics which they are able to apply to a range of contexts
- Sound procedural and conceptual understanding
- An ability to reason about a concept and make connections
- An ability to solve complex problems by breaking them down into smaller steps and showing resilience.

Implementation

At Churchwood Primary Academy, we follow a mastery approach to teaching mathematics, using the Mathematics Mastery curriculum. Typically, you will see the following features to mathematics learning:

- The large majority of pupils progress through the curriculum content at the same pace. Differentiation is achieved by emphasising deep knowledge and through individual support and intervention. The questioning and scaffolding individual children receive in class as they work

through problems will differ and pupils who grasp concepts rapidly are challenged through more demanding problems which deepen their knowledge further.

- Practise and consolidation play a central role to mathematics learning. Carefully designed variation within this builds fluency and understanding of underlying mathematical concepts in tandem.

- Teachers use precise questioning in class to challenge children's conceptual and procedural knowledge as well as their problem solving and reasoning skills. This ensures early identification of children who may not make the expected progress without additional intervention.

- Teachers use the CPA approach (concrete, pictorial, abstract) to ensure that concepts are modelled to children using multiple representations. This ensures that procedural and conceptual understanding are developed simultaneously.

Curriculum – Early Years Foundation Stage

In the Early Years Foundation Stage children's knowledge is developed through the use of purposeful, play based experiences represented through the indoor and outdoor environment. Learning is based on children's interests and current themes and will focus on the expectations from Development matters and the Early Learning Goals.
As children progress through, more focus is placed on representing their mathematical knowledge through more formal exercises. Children are encouraged to record their mathematical thinking when ready and this increases throughout the year.

Curriculum – Years 1 to 6

From Year 1 to Year 6, maths lessons are taught daily using a variety of teaching methods and approaches. . We follow a structured curriculum map, however this is flexible to the needs of the children and therefore if most children have not grasped a concept thoroughly, there is flexibility to adapt the curriculum and revisit concepts.
Those children who grasp concepts more rapidly are given opportunities to deepen their knowledge further and improve their reasoning skills, through rich problems, rather than accelerating on to new curriculum content. Children are challenged through sophisticated problem solving tasks that encourage them to apply the concept to gain depth of understanding.
Provision is made for children who require extra support through fluid intervention groups, differentiated class teaching and use of concrete apparatus to support.

Curriculum – ASD Facility

Within our ASD facility, children have personalised learning tasks linked to individual assessment. Learning is taught, scaffolded, prompted and then once children are confident they work independently where possible. Children frequently revisit key skills to develop their confidence and independence. Concrete apparatus and pictorial representations are used to support learning where appropriate

Lesson Design

Teachers mostly follow a simple lesson structure (see Appendix 1). They will briefly recap prior learning before then building on this learning by introducing the next step to children. Teachers use concrete apparatus and visual representations at every opportunity to reinforce the concept and ensure deep and meaningful understanding. Children have opportunities to practise new skills using carefully crafted and varied questioning and talk is used regularly to allow children opportunities to demonstrate their reasoning skills.

Thorough Assessment for Learning is used to target children who have not grasped a concept in order to target support and also children who have understood in order to challenge them with reasoning and problems solving activities. During independent learning children should, as far as possible, practise the

skills that they have acquired independently to avoid an over-reliance on adults, however throughout this time, additional staff should work with different children to support and assess learning.

Differentiation

Differentiation will be seen by pupils working on differing complexities of reasoning and problem solving within the same objective. Children who grasp concepts quickly will have challenging problems, involving reasoning, to solve to ensure that they continue to make progress and to deepen their understanding of the concept. There will be some children who are using practical equipment for longer in order to support their learning. We aim to close the gap between mathematical attainment within our classes, but accept that in some Key Stage 2 classes there is already a gap in attainment of groups of pupils. There will therefore be a need to give some pupils in these year groups separate mathematical activities.

Interventions

Using formative assessment gathered through the practise tasks, teacher questioning and other formative assessment methods, any pupils who have not grasped the concept or who have misconceptions should have a rapid intervention to ensure that they are ready for the next step of learning. Where possible, this will occur on the same day (or already as part of the maths lesson) to ensure that gaps are rapidly addressed, ready for the next steps.

Resources and environment

Within all lessons, teachers utilise practical resources to ensure that concepts are represented to the children, in multiple ways, to gain depth of understanding. Maths working walls are also used to support learning and incorporate key mathematical vocabulary. Resources that support Maths throughout the year will always be available and displayed in classrooms (eg. Hundred squares and number lines).

Mathematics and the wider curriculum

Generally, Maths will be taught discretely to ensure that links are not tenuous, however teachers seek to take advantage of opportunities to make cross-curricular links. Teachers plan for children to practise and apply the skills, knowledge and understanding acquired in their Maths sessions to other areas of the curriculum. An example of this is statistics within Science or Geography, which allows children to develop their maths skills and can be used to evidence depth of understanding.

Impact

Assessment and Reporting

Teachers will use targeted questions and problems that require children to remember, understand, apply analyse and evaluate their knowledge and skills. These assessments are used to informed the Target Tracker statements to assess pupils on an ongoing basis and a judgement about whether a child is on track to achieve age-related expectations will be made at the end of the term by making a ‘step’ judgement. This information will all be recorded in Target Tracker and discussed at Pupil Progress Meetings, which are held termly between teachers and members of the Senior Leadership Team.

We also use some formal written assessments to help support our teachers in comparing their children to national averages.

Appendix 1 – Typical structure of a maths lesson

Do Now (approx 5 mins)

This should act as a warm up for all children, with a rapid pace. This does not have to be linked to the main learning objective (aim) for the session, however it should engage all children and they should all experience success. The practice they are doing will help them later in the lesson or build fluency in a key skill.

New Learning - Introduce the Aims, Remember Tos and key language

Teachers may wish to generate the Remember Tos with the children later on in the input (during modelling), however it is vital that these key aspects are displayed throughout the session for all pupils. This part of the lesson may be extended to teach new language using the Word Aware approach. Misconceptions are anticipated and incorporated. The Talk task / Let's Explore task is modelled.

Talk Task / Let's Explore

Children are expected to speak in full sentences, using words and symbols accurately. Everyone is using manipulatives when appropriate. No recording is expected, although individual whiteboards may be used.

Develop Learning

References are made to previously learnt models / representations / skills / concepts. All children are ready to answer questions, answer in full sentences and use words / symbols accurately. Any misconceptions are anticipated and incorporated. The independent task is modelled.

Assess the pupils

Teachers may use a combination of techniques including carefully planned questions combined with the use of individual whiteboards or other assessment strategies. This helps to inform the activity children undertake, whether some children can start their activity sooner and whether adult support is required for some children.

Independent Task

All children are engaged in completing the task and have access to appropriate concrete manipulatives. All children, where appropriate, are engaged in learning the same mathematical concept or skill, with an appropriate amount of scaffolding. The emphasis is on understanding and developing fluency, rather than rushing to 'cover' ideas. Extension or challenge tasks may involve deeper understanding of the same mathematical concept or skill. Challenges may involve solving less routine problems, demonstrating using concrete manipulatives / drawing diagrams, explaining in full sentences or asking their own questions.

Plenary

This includes celebration of success and reaffirmation that success comes from effort.

Appendix 2 – Progression in Calculations

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Progression in Calculations: ADDITION

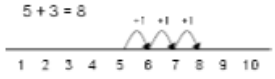
BAND 1

Children are encouraged to develop a mental picture of the number system in their heads to use for calculation. Children use pictures, stories and songs and use objects and materials to help develop this.

They use their counting skills to find one more than, using resources to help count. They use models and images to support learning number bonds to 10, moving on to 20 (including Numicon) Introduce missing number problems e.g. 7 = _ - 9
and calculations where = is at the start.

They physically jump along a number line. Written number sentences are introduced with the appropriate mathematical symbols. Calculations must be orally rehearsed.

Teachers start to introduce the use of the number line to support with adding 1-digit and 2-digit number to 20.



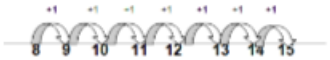
BAND 2

Developing a range of mental methods

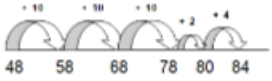
Use concrete objects, including base 10, and pictorial representations to add.
Use an apply number bonds and place value knowledge to recall facts e.g. 2 + 3 = 5 so 20 + 30 = 50.
Children to add in multiples of tens and ones on number squares, preparing to calculate mentally using partitioning and place value.

Use of blank number lines

8 + 7 =



48 + 36 =

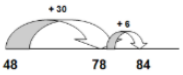


Children to recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing numbers problems. i.e. 44 + __ = 100 ⇨ 100 - 44 = ___

BAND 3

Continue to develop efficiency with a number line then introduce column method with expanded addition:

Children to cement understanding of partitioning through adding multiples of ten. 48 + 36 =
Children to add numbers with 3 digits using formal methods.



No bridging required

```
  H T U
  1 4 3
+ 2 5 4
    7 (3 + 4)
  9 0 (40 + 50)
  3 0 0 (100 + 200)
  3 9 7
```

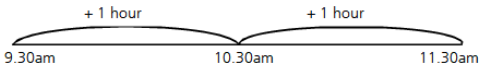
Bridging needed

```
  T U
  5 7
+ 3 5
  1 2 (7 + 5)
  8 0 (50 + 30)
  9 2
```

Children to estimate answer to calculation and use inverse to check.

(Leave one clear square before the bracket.)

Addition of time



BAND 4

Compact Column Method

Children to add numbers with 4 digits using formal methods.

Adding

- First 1's/units
- then 10's
- then 100's
- Then 1000's

```
   Th H T U
    3 2 6 7
+     5 8 6
  ---------
    3 8 5 3
      1 1
```

'Carry the hundred'

Children to continue to estimate answer to calculation and use inverse to check.

Column headings need to be included

BAND 5

Compact Column Method

Children to add whole numbers with more than 4 digits (extending to more than two numbers) using formal methods.

```
  TTh Th H T U
   6  4 2 5 3
+     4 4 7 9
  ------------
   6  8 7 3 2
      1   1
```

'Carry the hundred'

Extend to decimals in the context of money and measure.

```
   Th H T U . t h
   £2 4 4 2 . 4 9
+      £7 3 . 4 2
  ---------------
   £2 5 1 5 . 9 1
      1       1
```

'Carry the hundredths'

Children to use rounding to check answers to calculations and determine, in the context of the problem, levels of accuracy.

Column headings need to be included.

BAND 6

Compact Column Method

Extend addition to more than two numbers and decimal numbers including complex decimal quantities.

```
  Th H T U . t h
  £4 6 8 1 . 9 0
     £ 2 6 . 8 5
+    £ 0 . 7 2
  ---------------
  £4 7 0 9 . 4 7
    1   2
```

Children to solve multi-step word problems involving numbers of this difficulty.

1.05 + 0.8 + 0.405

Encourage children to use zero as a place holder to improve their accuracy.

```
  U . t h th
  1 . 0 5 3
  0 . 8 3 3
+ 0 . 4 0 5
  ---------
  2 . 2 5 5
  1
```

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Progression in Calculations: SUBTRACTION

BAND 1

Children are encouraged to develop a mental picture of the number system in their heads to use for calculation.

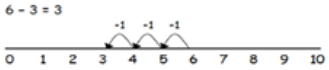
Children use pictures, stories and songs and use objects and materials to help oral rehearsal is essential.

They count and point using objects, physically moving them. They respond to questions like – 'I have 3 balloons, 2 burst. How many are left?'

They use their counting skills to find one less than, using resources to help count (up to 100). They physically jump along a number line.

Written number sentences are introduced with the appropriate mathematical symbols.

Teachers start to introduce the use of the number line.



Develop use of the number line by counting back initially with numbers below 20 e.g. 17 - 5. Then move onto larger numbers. Use your discretion to decide when it is time to move from a marked to an empty number line.

BAND 2

Developing the use of blank number line

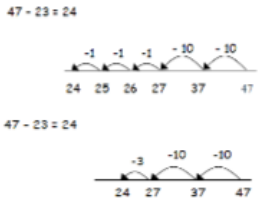
Use concrete objects, including base 10, and pictorial representations to subtract.

Children to subtract in multiples of tens and ones, preparing to calculate mentally using portioning and place value. Use an apply number bonds and place value knowledge to recall facts e.g.

5 – 2 = 3 so 50 – 20 = 30.

Note: It is vital that children can count back in tens from any number.

Then help children to become more efficient by subtracting the units in one jump (by using the known fact 7 – 3 = 4).

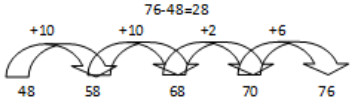


Children to recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing numbers problems. i.e. 100 - 44 = ___ 44 + __ = 100

BAND 3

Continue to develop efficiency with a number line then expander column method with expanded subtraction:

The children to be introduced to complementary addition method for subtraction. The use of models, such as Dienes or Cuisenaire, is extremely important here to understand the idea of "difference."



Children to continue to estimate answer to calculation and use inverse to check.

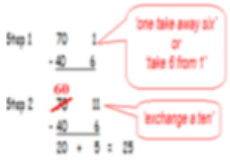
Expanded Written Method

Children to subtract numbers with **r mid !**3 digits using formal methods. Building understanding of place value and ability to partition numbers

No exchanging required

89 = 80 9
- 57 - 50 7
30 + 2 = 32

Exchanging needed



BAND 4

Developing the expanded written method to use with up to 4 digit numbers

Children to subtract numbers with **r mid !**4 digits using formal methods.

Children to continue to confidence in expanded method including mixed numbers i.e. 4523 - 312 =

Develop understanding of place value through exchanging with the use of physical resources if necessary; such as dienes

600 140
~~700~~ + ~~50~~ + 14
- 200 + 80 + 6
400 + 60 + 8 = 468

Children to continue to estimate answer to calculation and use inverse to check.

BAND 5

Compact Method

Children to subtract whole numbers with more than 4 digits using formal methods.

3754 - 286

614 1
3~~7~~~~5~~4
- 286
3468

Extend to decimals in the context of money and measure.

Children to use rounding to check answers to calculations and determine, in the context of the problem, levels of accuracy.

6 1 1 13
£3 8 ~~7~~ 1 4 ~~2~~ . ~~4~~ 5
- £7 3 7 1 . 4 9
£3 1 3 7 1 . 9 6

BAND 6

Compact Method

Children to develop subtraction with mixed decimal up to 3dp

E.g. 4381.72 - 427.496

3 7 6 11
~~4~~ 1 3 ~~8~~ 1 . ~~7~~ ~~2~~ 1 0

Children to use zero as a place holder

- 4 2 7 . 4 9 6
£3 9 5 4 . 2 2 4

Children to solve multi-step word problems involving numbers of this difficulty.

Children to use the same method when zeros are within the number and need to exchange through it.

8 9 1
2 ~~0~~ ~~0~~ 3 . 4 2
- 2 2 4 . 2 1
2 6 7 9 . 2 1

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Progression in Calculations: MULTIPLICATION

BAND 1

Multiplication concepts introduced through addition and addition strategies.
Use of concrete apparatus for the children to physically count and see.
Number rhymes are used and rehearsed.

Mostly pictorial representations

How many groups of 2 are there?

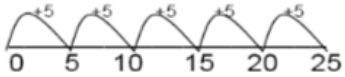
Laying the foundations for multiplying by maximizing opportunities when counting in 2's, 5's and 10's

Understand multiplication as repeated addition - vxs s r uvhg e| apparatus e.g multilink.

Laying the foundations for multiplying by maximizing opportunities when counting in 2's, 5's and 10's

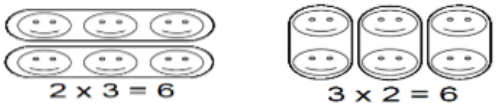
Understand multiplication as repeated addition - supported by apparatus.

5 x 5 = 5 + 5 + 5 + 5 + 5



BAND 2

Understand multiplication as groups:



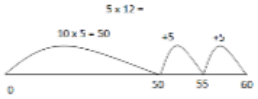
understand commutative law:
4 x 5 = 5 x 4

Understand multiplication as a arrays:

7 x 5 = 35

5 x 7 = 35

Develop multiplication as repeated addition through adding known multiples of a number (2's, 5's or 10's)



Recall and use x and ÷ facts for 2x, 5x and 10x tables.

BAND 3

Progression on to more formal methods
Children to multiply 2 digit by 1 digit numbers.
Introduce grid method
Use partitioning to support mental methods

Once secure, this step can left off.

24 x 3 =
20 4

X	20	4
3	60	12

12
+60
72

Work with times table facts children can do mentally in order to experience success.

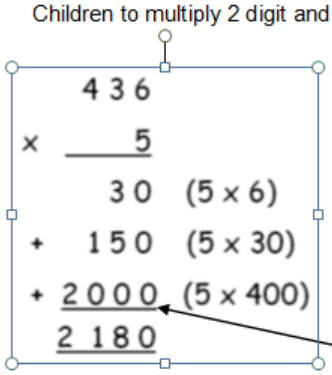
4 x 3 = 12
20 x 3 = 60
60 + 12 = **72** ⇦ *Final step to support future method.*

Recall and use x and ÷ facts for 3x, 4x and 8x tables.

BAND 4

Progressing to formal written methods
Extended column method

Children to multiply 2 digit and 3 digit by 1 digit numbers.



First, multiply U by U
Next, U by T
Then, U by H
Finally, add answers together

Leave one square gap.

Recall x and ÷ facts up to 12 x 12

BAND 5

Develop greater understanding of expanded column method progression on to compact method.

Children to multiply up to 4 digits by a 1 or 2 digit numbers.

Expanded method

	3 7 6	
x	4 3	
	1 8	(3 x 6)
+	2 1 0	(3 x 70)
+	9 0 0	(3 x 300)
	2 4 0	(40 x 6)
	2 8 0 0	(40 x 70)
	1 2 0 0 0	(40 x 300)
	1 6,1 6 8	
	2	

Moving on to the compact method
4265 x 6 =
4265
X 6
25590
1 3 3

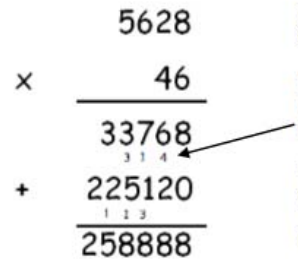
Beginning to introduce long multiplication
For up to 4 by 2 digits

Children should be encouraged to estimate and check the reasonableness of their answers.

BAND 6

Compact Long Multiplication Method

Children to multiply a 4 digit by 2 digit numbers.



First, multiply 5628 by 6, digit at a time.

Carry over digits to be added to the next multiplied answer (ensure these are written smaller).

Next, multiply 5628 by 40, digit at a time.

Finally, add up answers.

Extend to decimals
(TU.t x U and TU.t x U.t)

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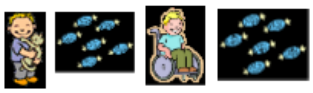
Progression in Calculations: DIVISION

BAND 1

Practical experience of sharing.
'One for me, one for you' is repeated subtraction of one. The children share out toys, fruit and other materials in context where possible.
There are 12 sweets and 2 children. They share the sweets equally, how many sweets does each child have?



Introduce Grouping
Give visual images and opportunities to physically sort objects and people into groups, e.g. There are 15 sweets and each party bag needs three sweets. How many party bags can be made?

Develop understanding of division and use jottings, including dots or tally marks, to support calculations.

Sharing equally - 12 apples shared between 3 people, how many do they each get?

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BAND 2

Beginning to use blank number lines.

Solve grouping and sharing problems by repeated addition on an empty number line, e.g. A chew bar costs 5p. How many can I buy with 20p? 20 ÷ 5 =

Cuisenaire and a number rod track make an effective

Begin to extend to calculations with remainders

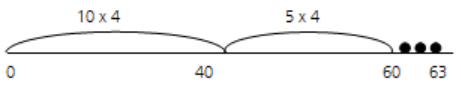
Introduce the concept of a **remainder** through real situations, e.g. A chocolate bar costs 10p. How many can I buy with 35p? How much money will I have left over? 35 ÷ 10 = 3 r5

I can buy 3 chocolate bars and I will have 5p left.

Recall and use x and ÷ facts for 2x, 5x and 10x tables.

BAND 3

Consolidate calculations with remainders and developing to jump in 'chunks' of the divisor, 63 ÷ 4 = 15 r3



10 x 4 = 40
5 x 4 = 20
2 x 4 = 8

Children should make a note of 10x, 5x and 2x the divisor to help them choose an appropriate 'chunk'.

As a next step. children should also record re-mainders as a fraction.
63 ÷ 4 = 15 ¾

Children to be able to divide numbers with 2 digits by 1 digit.

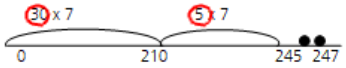
Recall and use x and ÷ facts for 3x, 4x and 8x tables.

BAND 4

Extend use of number line to larger numbers where children jump in chunks of multiples of 10.

Children to be able to divide numbers with 3 digits by 1 digit

247 ÷ 7 = 35 r2 = 35 2/7



Once secure, link and extend to vertical 'chunking' method

412 ÷ 7 = 58 r6
= 58 6/7

50 x 7	350
5 x 7	+ 35
	385
3 x 7	+ 21
	406
remainder	+ 6
	412

Children need a secure knowledge of 'tables' facts and be able to derive associated facts.

5 x 7 = 35 so

50 x 7 = 350

Keep making a note of key multiples to support.

Recall x and ÷ facts up to 12 x 12

BAND 5

Compact Written Method

It is important that children have a clear conceptual under-standing of division before moving onto the 'bus-stop' meth-od.

Children to be able to divide numbers up to 4 digits by 1 digit

```
  1
 4 2 9 1
```

This method is easily extended into decimal remainders.

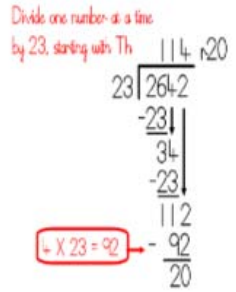
```
 4 2 9 1.0 0
```

BAND 6

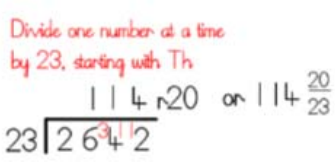
Compact Written Method - Long and Short division

Children to be able to divide numbers with 4 digits by 2 digit

Long Division (4 by 2)



Short Division (4 by 2)



Policy status and review

Written by:	Jo Bodiam (Mathematics Lead)
Owner:	Ros Collett (Principal)
Status:	Approved
Approval date:	January 2022
Review Date:	January 2023